

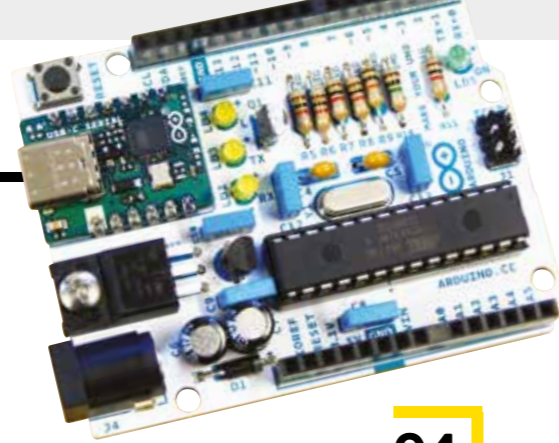
Contents

06 SPARK

- 06 **Top Projects**
Special things made to delight and entertain
- 16 **Objet 3d'art**
A flexible filament device protector
- 18 **Letters**
Christmas PCBs and the joy of pointless making
- 20 **Meet the Maker: Joseph Herscher**
The modern Heath Robinson/Rube Goldberg

25 LENS

- 26 **20 Amazing Raspberry Pi Projects**
Spectacular ideas to borrow/steal for your next build
- 38 **How I Made: Heated seating**
Keep your posterior warm this winter
- 44 **Interview: Michael Carroll**
Inspiring inventions with \$2 and some cardboard
- 52 **Improviser's Toolbox**
Fun things to do with eating implements
- 56 **In the workshop: LEDs**
Lighting up a bicycle



94

Cover Feature

20 Amazing RASPBERRY PI PROJECTS

Awesome builds for the world's best **TINY** computer

26

Tutorial

Control many LEDs



60 More light-emitting diodes than a single microprocessor can handle



52



96

Meet the Maker

Joseph Herscher



20 This person makes machines that make people smile



56

Tutorial

Custom cases



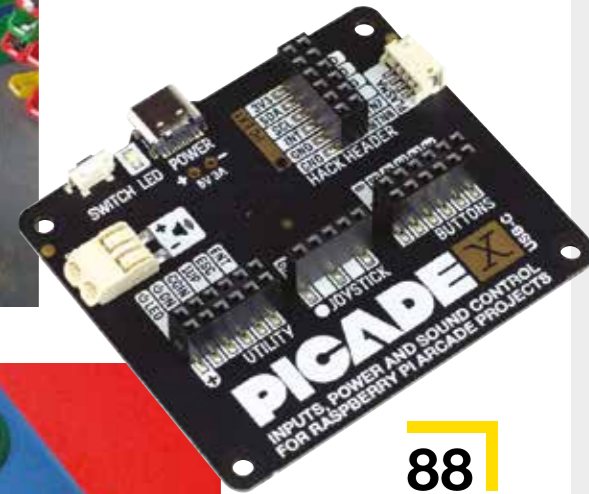
70 Protect the precious things with a 3D printer and some M3 bolts

59 FORGE

- 60 **SoM LEDs**
Control many, many lights
- 66 **Tutorial Raspberry Pi Pico**
Build a mood light with a Pico W
- 70 **Tutorial Custom enclosures**
Keep electronics tidy with 3D printing and fabric
- 74 **Tutorial Mastodon**
Use a Pico W to interact with the internet
- 80 **Tutorial Radio communication**
Link devices over the airwaves

87 FIELD TEST

- 88 **Best of Breed**
Gaming controllers – the best technology ever
- 94 **Review Arduino kit**
Solder your own classic microcontroller
- 96 **Crowdfunding**
Origami, meet LEDs



88



06

Some of the tools and techniques shown in HackSpace Magazine are dangerous unless used with skill, experience and appropriate personal protection equipment. While we attempt to guide the reader, ultimately you are responsible for your own safety and understanding the limits of yourself and your equipment. HackSpace Magazine is intended for an adult audience and some projects may be dangerous for children. Raspberry Pi Ltd does not accept responsibility for any injuries, damage to equipment, or costs incurred from projects, tutorials or suggestions in HackSpace Magazine. Laws and regulations covering many of the topics in HackSpace Magazine are different between countries, and are always subject to change. You are responsible for understanding the requirements in your jurisdiction and ensuring that you comply with them. Some manufacturers place limits on the use of their hardware which some projects or suggestions in HackSpace Magazine may go beyond. It is your responsibility to understand the manufacturer's limits. HackSpace magazine is published monthly by Raspberry Pi Ltd, Maurice Wilkes Building, St. John's Innovation Park, Cowley Road, Cambridge, CB4 0DS, United Kingdom. Publishers Service Associates, 2406 Reach Road, Williamsport, PA, 17701, is the mailing agent for copies distributed in the US. Application to mail at Periodicals prices is pending at Williamsport, PA. Postmaster please send address changes to HackSpace magazine c/o Publishers Service Associates, 2406 Reach Road, Williamsport, PA, 17701.